



Defining Performance Metrics for the Long-Term Experimental and Management Plan

Technical Work Group Meeting
June 15, 2022

Helen C. Fairley

**USGS Southwest Biological Science Center,
Grand Canyon Monitoring and Research Center**

Project Overview (Purpose and Need)

- **LTEMP defines 11 Goals**
 - **How do we know if Goals are being achieved?**
 - **Need to define performance metrics**
- **Section 6.1(c) of the LTEMP ROD***

“The DOI, in consultation with the AMWG, will develop monitoring metrics for the goals and objectives using those in Appendix C as a starting point.”

(Note: Appendix C = performance metrics developed by Runge et al. (2016) to help select the preferred LTEMP alternative.)
- **FY 21-23 TWP, Reclamation Project C.12**

* Department of Interior, 2016, Record of Decision for the Glen Canyon Dam Long Term Experimental and Management Plan Final Environmental Impact Statement, December 2016. Bureau of Reclamation, Upper Colorado River Region, Salt Lake City, Utah and National Park Service, Intermountain Region, Lakewood, Colorado.

Monitoring & Metrics

Monitoring & metrics serve a variety of purposes. Principal types and reasons for monitoring include:

- **Effectiveness (or Performance) Monitoring**

1. To assess effectiveness of policy, plan, or legislation
2. To evaluate progress towards achieving management objectives or regulatory standards

- **Surveillance Monitoring**

3. To detect incipient trends (“early warnings”)
4. To determine resource status in order to decide appropriate management actions

- **Validation Monitoring**

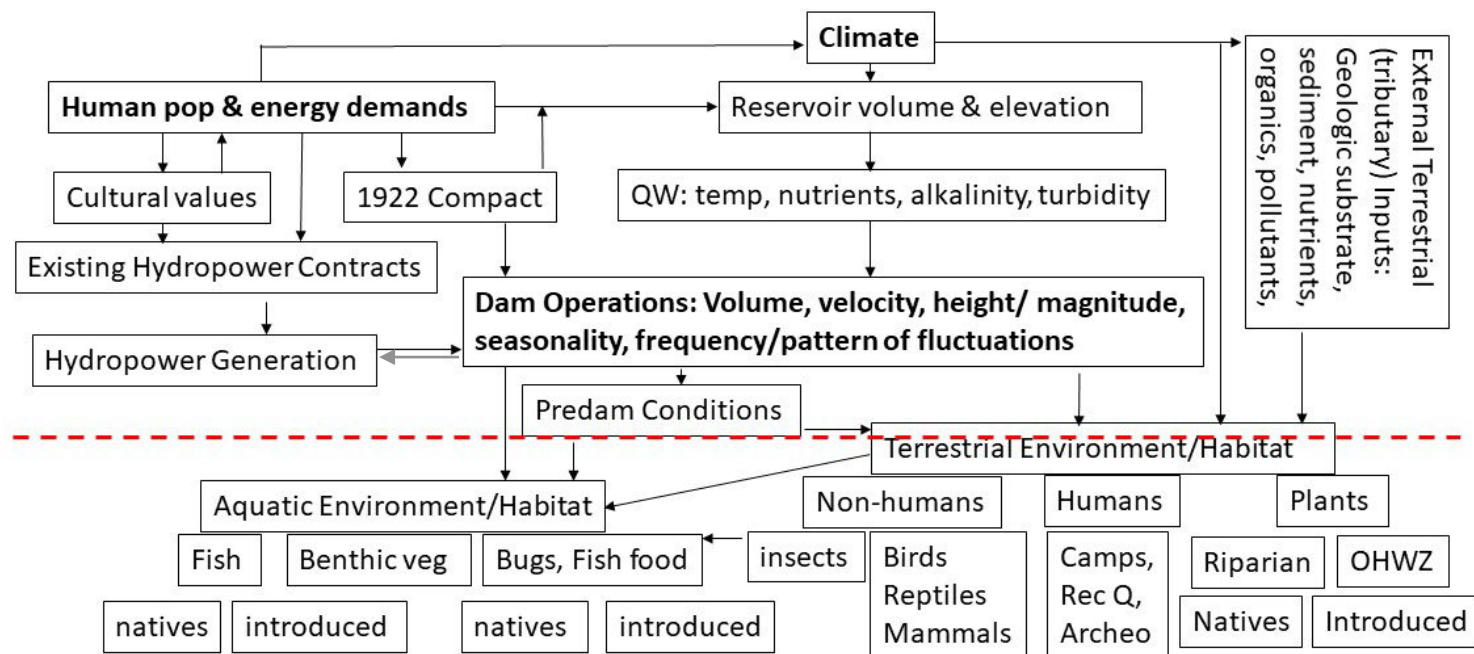
5. To increase our understanding of resource dynamics
6. To develop and refine models or predictions

This Project

- Focus is on defining metrics for assessing and tracking achievement of LTEMP Goal outcomes
 - metrics for other objectives & purposes to be defined later
- Focus is on defining metrics for Effectiveness Monitoring (“Phase 1”)
 - “To assess effectiveness of policy . . .” and
 - “ track progress towards achieving management objectives . . .”
- Performance metrics tell us “achieving / achieved” or “not achieved” -- but not necessarily why
- This will NOT be a comprehensive Monitoring Plan!

Multiple External Factors Affect LTEMP Goal Outcomes

Socio-ecological drivers of CRe conditions



LTEMP Performance Metrics: Criteria

- Reflects the expected performance outcome of each LTEMP goal (or measures a performance outcome triggering a legal compliance action or experiment)
- Quantifiable (metric = measurable)
- Technically & financially feasible to measure
- Relevant to the metrics used to select LTEMP preferred alternative

Metrics design & selection

Some basic tenets of metrics design and selection include:

- Prioritize quality of metrics over quantity
- Design metrics that are easy to understand
- Design metrics that are easy to compare

Metric Description Format

Goal X Statement

Background (sets stage and rational for selecting specific metrics)

Conceptual diagram (shows “means variables” & “ecological drivers”)

Metric X.1 (Metric Name)

- **Metric Type:** direct observation/measurement, estimate based on model, etc.
- **Relevant Criteria:** Describe how it relates to the established criteria for metrics
- **Data required:** Data required to produce the metric
- **Metric calculation:** How metric will be calculated
- **Frequency:** How often will the metric be measured?
- **Presentation:** How will the metric be presented (graphically; example provided)
- **Interpretation:** How will metric be interpreted (historic range, trend, thresholds?)
- **Limitations and uncertainties of the metric**

Draft Metrics, Goal 2

■ Goal 2 – Natural Processes

Restore, to the extent practicable, ecological patterns and processes within their range of natural variability, including the natural abundance, diversity, and genetic and ecological integrity of the plant and animal species native to those ecosystems

- 2.1 Seasonal Timing of River Flow
- 2.2 Sub-daily fluctuation in River Flow
- 2.3 Springtime Gross Primary Productivity
- 2.4 Percent EPT

Draft Metrics, Goal 3

■ Goal 3- Humpback Chub

Meet humpback chub recovery goals, including maintaining a self-sustaining population, spawning habitat, and aggregations in the Colorado River and its tributaries below the Glen Canyon Dam

- 3.1 Current tier of HBC in LCR aggregation
- 3.2 Grand Canyon-wide HBC abundance
- 3.3 Proportion of Grand Canyon ecosystem with evidence of all 3 life stages

Draft Metrics, continued

■ Goal 5 – Other Native Fishes

Maintain self-sustaining native fish species populations and their habitats in their natural ranges on the Co. River and its tributaries

- 5.1 - 5.3: Proportion of the Grand Canyon ecosystem with evidence of all 3 life stages of bluehead sucker (5.1), flannel mouth sucker (5.2), razorback sucker (5.3)
- 5.4 Proportion of GCE with speckled dace (any life stage)
- 5.5 Proportion of GCE with extirpated species (any life stage)

■ Goal 9 – Rainbow Trout

Achieve a healthy high-quality recreational rainbow trout fishery in GCNRA and reduce or eliminate downstream trout migration consistent with NPS fish management and ESA compliance

- 9.1 Trout Angler Catch Rate
- 9.2 Rainbow Trout Abundance

Draft Metrics, continued

■ Goal 4 – Hydropower

Maintain or increase Glen Canyon Dam electric energy generation, load following capability, and ramp rate capability, and minimize emissions and costs to the greatest extent practicable, consistent with improvement and long-term sustainability of downstream resources

4.1 – Economic Value of Hydropower

■ Goal 6 – Recreation

Maintain and improve the quality of recreational experiences for the users of the Colorado River Ecosystem. Recreation includes, but is not limited to, flatwater and whitewater boating, river corridor camping, and angling in Glen Canyon

6.1 – Economic Value of Recreation Experience

Draft Metrics, continued

■ Goal 10 – Non-native aquatic species

Minimize or reduce the presence and expansion of aquatic nonnative invasives.

- 10.1 - 10.4: Average number of risky species per habitat segment in GCE
- 10.5 - 10.8: Average number of risky species per habitat segment in GCE
 - 10.1, 10.5 = Low risk species
 - 10.2, 10.6 = medium risk species
 - 10.3, 10.7 = high risk
 - 10.4, 10.8 = very high

Draft Metrics, continued

■ Goal 11 – Riparian vegetation

Maintain native vegetation and wildlife habitat, in various stages of maturity, such that they are diverse, healthy, productive, self-sustaining, and ecologically appropriate

- 11.1 Total plant cover
- 11.2 Native plant richness
- 11.3 Native to non-native plant species cover ratio

Goals/Metrics still under discussion

- 1. Archaeological and Cultural Resources. Maintain the integrity of potentially affected NRHP-eligible or listed historic properties in place, where possible, with preservation methods employed on a site-specific basis.
 - Agreement on 3 metrics; discussing need for 4th one
- 7. Sediment. Increase and retain fine sediment volume, area, and distribution in the Glen, Marble, and Grand Canyon reaches above the elevation of the average base flow for ecological, cultural, and recreational purposes.
 - Agreement on 2 metrics; discussing need for 3 others
- 8. Tribal Resources. Maintain the diverse values and resources of traditionally associated Tribes along the Colorado River corridor through Glen, Marble, and Grand Canyons.

Next Steps

- **Today:** Provide input on draft metrics (descriptions - format, content, interpretability, graphical presentations, interpretability, etc.)
- **June 16-30, 2022:** TWG members review draft report; submit written comments NLT 6/30
- **July-August 2022:** Complete discussions re: metrics for Goals 1, 7, & 8; GCMRC revises and finalizes draft metrics for other LTEMP goals
- **September 2022:** final draft metric descriptions (all goals); present to TWG October 2022



Questions?